

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.:

Group Art Unit:

Inventors: Acharya et al.

Filed: Concurrently

Title: Low Frequency Pulse Tube System
With Oil-Free Drive

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

In accordance with 37 CFR 1.51, 1.56 and 1.97 to 1.99, the following is a relevance statement on each citation listed on attached form PTO-1449, and is made of record to assist the Patent & Trademark Office in its examination of this application:

U.S. 5,113,663 – Gifford discloses a multi-stage cryogenic refrigerator utilizing the Gifford-McMahon cycle which has an external regenerator in each stage. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 5,389,844 – Yarr et al. discloses a linear electrodynamic machine having non-axisymmetric interdigitating interfaces between moving and fixed magnetic circuit elements. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 5,398,512 – Inaguchi et al. discloses a cold accumulation type refrigerating machine wherein rotation output of a stepping motor is converted to a reciprocative motion of a displacement member carrying a cold accumulator and disposed within a cylinder. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 5,431,551 – Aquino et al. discloses a rotary positive displacement device containing a housing having a curved inner surface with a profile equidistant from a troichoidal curve and an eccentric mounted on a shaft disposed within the housing. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 5,487,272 – Nagao discloses a cryogenic refrigerator having a first compressor, a first expander having at least one accumulator, and a second compressor which compresses the working fluid. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 6,138,459 – Yatsuzuka et al. discloses a linear compressor for compressing and expanding working fluid contained in a regenerative refrigerator composed of a compressor casing in which a pair of pistons is disposed along with a plurality of electromagnets for driving the pair of pistons. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more

efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 6,209,328 – Kim et al. discloses a compressor integrated pulse tube refrigerator of the oil-free type having a driving unit which includes a sealed casing having a cylinder disposed at an upper center portion and a working gas filled therein, and a linear motor installed in the interior of the sealed casing. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 6,378,312 – Wang discloses a component for use in a pulse tube cryorefrigerator which integrates the reservoirs or buffer volumes as well as the housing for the rotary valve, valve plate and drive motor. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

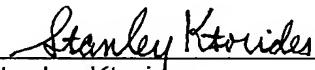
U.S. 6,374,617 – Bonaquist et al. discloses a pulse tube system wherein a product fluid such as hydrogen is preferably precooled and then liquefied, subcooled and/or densified by heat exchange with ultra cold gas generated by a pulsing compression wave which rejects heat into a cryogen fluid heat sink. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 6,640,553 – Kotsubo et al. discloses a pulse tube refrigeration system having a pulse generator, a regenerator and a pulse tube, comprising a

tapered work transfer tube interposed between the pulse generator and the regenerator. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

U.S. 6,644,038 – Acharya et al. discloses a pulse tube refrigeration system wherein the pulse tube working gas is cooled to a defined first stage temperature and is brought to a defined second stage temperature by operation of a regenerator and pulse tube, which are in flow communication through a cold heat exchanger, prior to providing refrigeration to a high temperature superconductor. There is no disclosure of a pulse tube system for generating refrigeration wherein an oil-free compressor operating at a higher frequency generates pulsing gas which undergoes a frequency reduction and drives the pulse tube system at a more efficient lower frequency, and thus this patent neither discloses nor suggests applicants' claimed invention.

Respectfully submitted,



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Information Disclosure Citation

(Use several sheets if necessary)

Applicants
Acharya et al.

Filing Date

Group

U.S. PATENT DOCUMENTS

Examiner Initial	Document Number							Date	Name	Class	Subclass	Filing Date if Appropriate
	5	1	1	3	6	6	3					
	5	3	8	9	8	4	4	5/1992	Gifford	62	6	
	5	3	9	8	5	1	2	2/1995	Yarr et al.	310	15	
	5	4	3	1	5	5	1	3/1995	Inaguchi et al.	62	6	
	5	4	8	7	2	7	2	7/1995	Aquino et al.	418	61.2	
	5	4	8	7	2	7	2	1/1996	Nagao	62	6	
	6	1	3	8	4	5	9	10/2000	Yatsuzuka et al.	62	6	
	6	2	0	9	3	2	8	4/2001	Kim et al.	62	6	
	6	3	7	8	3	1	2	4/2002	Wang	62	6	
	6	3	7	4	6	1	7	4/2002	Bonaquist et al.	62	6	
	6	6	4	0	5	5	3	11/2003	Kotsubo et al.	62	6	11-20-02
	6	6	4	4	0	3	8	11/2003	Acharya et al.	62	6	11-22-02

FOREIGN PATENT DOCUMENTS

	Document Number							Date	Country	Class	Subclass	Translation	
												Yes	No

Other Documents (including Author, Title, Date, Pertinent Pages, Etc.)

Examiner

Date Considered

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